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1989 Annual AMS-MAA Survey

(First Report)

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1989 Annual AMS-MAA Survey

(First Report)

Report on the 1989 Survey of New Doctorates,
Edward A. Connors
Salary Survey for New Doctorates
Faculty Salary Survey
Doctoral Degrees Conferred, 1988–1989

Highlights

1. 904 doctorates in the mathematical sciences were awarded by U.S. institutions in the period July 1, 1988 through June 30, 1989. This is a 12% increase over last year and an 18% increase over the average of the fall counts for the last four years.

2. 411 U.S. citizens received doctorates in the mathematical sciences. This is only 46% of the total awarded by U.S. institutions, however.

3. 24% of the U.S. citizen doctorates were awarded to women. This is the largest percentage ever and a significant increase over the 20 to 21% awarded in the last six years.

4. Although women comprise 24% of the U.S. citizens receiving doctorates, only 16% of the new doctorate hires in the U.S. doctorate-granting departments were women.

5. 9 of the 411 U.S. citizen doctorates were black, 7 of whom were women. Black women account for 7% of the doctorates awarded to women U.S. citizens.

6. Median starting salary for new doctorates reporting teaching (or teaching and research) employment was $30,500 (men) and $31,000 (women).

Report on the 1989 Survey of New Doctorates

Edward A. Connors

This report presents a statistical profile of new doctorates in the mathematical sciences awarded by universities in the United States and Canada during the period July 1, 1988, through June 30, 1989. It includes the employment status of recipients of 1988-1989 doctorates in the mathematical sciences (as of August 31, 1989), an analysis of the data by sex, minority group, and citizenship, and reports trends in the number of doctoral degrees for each of Groups I through V (see box on next page for description of groups). Table 1 provides the response rates for the 1989 Survey of New Doctorates.

TABLE 1: Response Rates

Group I	39 of 39
Group II	42 of 43 including 5 with 0 degrees
Group III	73 of 84 including 19 with 0 degrees
Group IV	55 of 72 including 7 with 0 degrees
Group Va	12 of 16 including 2 with 0 degrees
Group Vb	15 of 31 including 2 with 0 degrees
Group VI	24 of 29 including 6 with 0 degrees

Doctorates Granted

For the first time, we report separately the number of new doctorates granted by U.S. and Canadian institutions. These fall counts will, as is customary, be updated in the Second Report of the 1989 Survey, to appear in a spring 1990 issue of *Notices*.

TABLE 2A: New Doctorates, Fall Counts

	84-85	85-86	86-87	87-88	88-89
U.S.	732	756	779	804	904
Canada	37	45	66	52	53
Total	769	801	845	856	957

TABLE 2B: New Doctorates, Fall and Spring Counts

	84-85		85-86		86-87		87-88		88-89	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
U.S.	732	765	756	782	779	808	804	828	904	*
Canada	37	42	45	45	66	66	52	55	53	*
Total	769	807	801	827	845	874	856	883	957	*

*To appear in a spring 1990 issue of *Notices*.

In Table 2C we record the number of new doctorates in the mathematical sciences in the U.S. and Canada from the years 1984-1985, exclusive of Group Vb. The response rate for Group Vb, which includes departments in engineering and management science, is the lowest of all groups.

TABLE 2C: New Doctorates Awarded by Groups I–Va

	84-85	85-86	86-87	87-88	88-89
I-Va	712	698	743	760	838**

** This is a fall count. The other entries in Table 2C are spring counts. Table 2C will be updated to include a spring count for 1988-1989 in a spring 1990 issue of *Notices*.

Employment Status of New Doctorates, 1988-1989

Table 3A shows the employment status, by type of employer and field of degree, of the 957 recipients of doctoral degrees conferred by the mathematical sciences departments in the U.S. and Canada between July 1, 1988, and June 30, 1989. The names of these individuals are listed with their thesis titles in a later section of this First Report of the 1989 Annual Survey. Again this year we present the employment status of the 179 women new doctorates in Table 3B.

There was an increase in new doctorates hired in Groups I-V (240 compared to 207 last year), with a significant increase in those hired by Group I departments (100 compared to 73). There was a slight increase in new doctorates hired by government and business (103 compared to 96). Although women comprise 24% of the new doctorates, only 16% of the new doctorates hired by Groups I-V were women.

In rows 1 through 5 of Table 3A the numbers represent those who have accepted appointments in U.S. doctorate-granting mathematical sciences departments (Groups I-V). In the next two rows the figures represent those accepting appointments in U.S. mathematical sciences departments granting masters and bachelors as the highest degree. The information was initially obtained from the department granting the degrees and from data subsequently supplied by recipients themselves.

Of the 619 new doctorates employed in the U.S. 68% (422) assumed academic positions in university or four-year college mathematical sciences departments (a three percentage point increase over last year), and 17% (103) took employment in government, business, or industry (a four percentage point decrease).

Table 3A shows as "not yet employed" about 4% of the 1988-1989 new doctorates, excluding those whose employment status is unknown. The data in Table 3A were obtained in many instances early in the summer of 1989 and do not reflect subsequent hiring; an update of Table 3A is planned for the Second Report in a spring 1990 issue of *Notices*. A similar update last year revealed that all but 11 new 1987-1988 doctorates found positions by fall 1988 (see *Notices*, November 1988, page 1303, and May/June 1989, page 535).

This first report on the 1989 Survey includes a report on the 1989 survey of new doctorates, a report on salaries of new doctorates, salary and on faculty members in four-year colleges and universities, and a list of names and thesis titles for members of the 1988-1989 Ph.D. class. The report is based on information collected from questionnaires distributed in May to departments in the mathematical sciences in colleges and universities in the United States and Canada, and later to the recipients of doctoral degrees granted by these departments between July 1988 and June 1989, inclusive. A second round of questionnaires was distributed in September, concerned with data on fall enrollments, majors, and departmental size. This data will appear in the second report on the 1989 Survey, in a spring 1990 issue of *Notices*.

For these reports, departments are divided into groups according to the highest degree offered in the mathematical sciences. The groups are described in the box in this report.

The 1989 Annual AMS-MAA Survey represents the thirty-third in an annual series begun in 1957 by the Society. The 1989 Survey is under the direction of the AMS-MAA Committee on Employment and Educational Policy (CEEP), whose members are Donna L. Beers, Morton Brown, Stefan A. Burr, Edward A. Connors (chair), Philip C. Curtis, Jr., David J. Lutzer, and James J. Tattersall. The questionnaires were devised by CEEP's Data Subcommittee whose members are Edward A. Connors (chair), Lincoln K. Durst (consultant), John D. Fulton, James F. Hurley, Charlotte Lin, Don O. Loftsgaarden, David J. Lutzer, James W. Maxwell (ex officio), Donald E. McClure, and Donald C. Rung. Comments or suggestions regarding this Survey may be directed to the subcommittee.

Groups I and II include the leading departments of mathematics in the U.S. according to the 1982 assessment of Research-Doctorate Programs conducted by the Conference Board of Associated Research Councils in which departments were rated according to the quality of their graduate faculty.[1]

Group I is composed of 39 departments with scores in the 3.0–5.0 range.

Group II is composed of 43 departments with scores in the 2.0–2.9 range.

Group III contains the remaining U.S. departments reporting a doctoral program.

Group IV contains U.S. departments (or programs) of statistics, biostatistics and biometrics reporting a doctoral program.

Group V contains U.S. departments (or programs) in applied mathematics/applied science, operations research and management science which report a doctoral program.

Group Va is applied mathematics/applied science; **Group Vb** is operations research and management science.

Group VI contains doctorate-granting departments (or programs) in the mathematical sciences in Canadian universities.

Group M contains U.S. departments granting a master's degree as the highest graduate degree.

Group B contains U.S. departments granting a baccalaureate degree only.

[1] These findings were published in *An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences*, edited by Lyle V. Jones, Gardner Lindzey, and Porter E. Coggeshall, National Academy Press, Washington, D.C., 1982. The information on mathematics, statistics and computer science was presented in digest form in the April 1983 issue of *Notices*, pages 257–267, and an analysis of the above classifications was given in the June 1983 *Notices*, pages 392–393. For a listing of departments in Groups I and II see April 1988 *Notices*, pages 532-533.

TABLE 3A: Employment Status of 1988–1989 New Doctorates in the Mathematical Sciences

Type of Employer	Algebra and Number Theory	Real and Complex Analysis	Geometry and Topology	Logic	Probability and Statistics	Applied Mathematics	Discrete Mathematics and Combinatorics	Numerical Analysis	Linear and Nonlinear Optimization	Other	Total
Group I	12	32	22	7	4	18		2		3	100
Group II	8	8	7	2	5	13	2	1	1		47
Group III	10	10	2	1	9	8	1	3	1	3	48
Group IV	1				30						31
Group V					4	7				3	14
Masters	7	18	9	2	12	21	4	3	1	2	79
Bachelors	21	18	15	1	16	8	12	1	2	9	103
Two-year Colleges	2	1	1		1	2		1			8
Other Academic Departments	2		3		22	13	2	4	7	9	62
Research Institutes	3		8		6	3		2		2	24
Government		1			9	6			1		17
Business and Industry	1	2	4	2	43	15	1	2	9	7	86
Canada, Academic	2	8	1		10	1	3	1			26
Canada, Nonacademic					2	4					6
Foreign, Academic	18	22	19	1	39	24	6	3	6	6	144
Foreign, Nonacademic		2	2	1	5	5		1	3	3	22
Not seeking employment	1		1		2	2	1	1			8
Not yet employed	7	6	11	1	17	9		2	1	6	60
Unknown	5	14	5	4	21	6	2	10	2	3	72
Total	100	142	110	22	257	185	34	37	34	56	957

TABLE 3B: Employment Status of 1988–1989 New Doctorates in the Mathematical Sciences Females Only

Type of Employer	Algebra and Number Theory	Real and Complex Analysis	Geometry and Topology	Logic	Probability and Statistics	Applied Mathematics	Discrete Mathematics and Combinatorics	Numerical Analysis	Linear and Nonlinear Optimization	Other	Total
Group I	1	3	1	2	1	1					9
Group II	1	3	2	1	1	2					10
Group III	2		1		2			1		1	7
Group IV					9						9
Group V					1	2				1	4
Masters	2	5	2	1	3	5	1				19
Bachelors	6	3	5		3	7	7			5	36
Two-year Colleges	2	1			1						4
Other Academic Departments					6	3		1	1	1	12
Research Institutes					1	1					2
Government					2	1					3
Business and Industry			2		12				3		17
Canada, Academic			1		3						4
Canada, Nonacademic											0
Foreign, Academic		3	5		7	4				1	20
Foreign, Nonacademic											0
Not seeking employment			1								1
Not yet employed		1	2		9	2					14
Unknown		1			3			2	1	1	8
Total	14	20	22	4	64	28	8	4	5	10	179

TABLE 4: Sex, Minority Group, and Citizenship of New Doctorates
July 1, 1988–June 30, 1989

U.S. DEGREES	MEN					WOMEN					TOTAL
	CITIZENSHIP					CITIZENSHIP					
RACIAL/ETHNIC GROUP	U.S.	Canada	Other	Not Known	Total Men	U.S.	Canada	Other	Not Known	Total Women	
Asian, Pacific Islander	5		216	1	222	2		39	2	43	265
Black	2		8		10	7		3		10	20
American Indian, Eskimo, Aleut			1		1						1
Mexican American, Puerto Rican, or other Hispanic	4	1	18		23	4		7		11	34
None of those above	281	9	134	1	425	82	1	16	1	100	525
Unknown	21	2	15	13	51	3	2	1	2	8	59
Total Number	313	12	392	15	732	98	3	66	5	172	904

CANADIAN DEGREES	MEN					WOMEN					TOTAL
	CITIZENSHIP					CITIZENSHIP					
RACIAL/ETHNIC GROUP	U.S.	Canada	Other	Not Known	Total Men	U.S.	Canada	Other	Not Known	Total Women	
Asian, Pacific Islander		1	8		9		1			1	10
Black			1		1						1
American Indian, Eskimo, Aleut											
Mexican American, Puerto Rican, or other Hispanic								1		1	2
None of those above		15	9		24		2	1		3	27
Unknown	1	10	1		12		1	2		3	15
Total Number	1	26	19		46		4	3		7	53

Sex, Minority Group, and Citizenship of New Doctorates, 1988-1989

Table 4 presents a breakdown according to sex, minority group, and citizenship of the new doctorates. The information reported in this table was obtained from departments granting the degrees and in some cases from the recipients themselves.

Of the 904 doctorates awarded by U.S. universities, the citizenship is reported as known for 884 recipients, with 411 reporting U.S. citizenship. Thus, only 46% of the doctorates awarded by U.S. institutions went to U.S. citizens. The percentage of U.S. citizens receiving doctorates in the mathematical sciences, having declined consistently, from 73% in 1979-1980 to 45% in 1987-1988, now shows a slight increase, to 46%. For the first time since 1984-1985 the number of U.S. citizen doctorates is over 400. Refer to Table 5 and the accompanying graphs.

Among the U.S. citizens receiving doctorates in the mathematical sciences, 9 were black (7 women, 2 men) and 8 were Hispanic (4 women, 4 men).

Women comprise 24% of the U.S. citizens receiving doctorates in the mathematical sciences, a three to four percentage point increase over the 20 to 21% reported for the last six years. Table 6 presents data for the period 1973-1974 through 1988-1989.

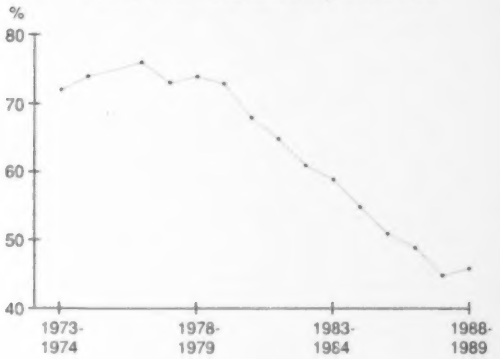
Citizenship and Sex of U.S. Doctorates, 1973 to 1989

Again this year, information is presented on the annual number of doctorates granted by U.S. universities to U.S. citizens since 1973 (Table 5). This number is divided into male and female doctorates (Table 6). In Table 5 the column headed Adjusted Total of Doctorates given by U.S. Universities gives the number of doctorates granted between July 1 and June 30 of the indicated years *whose citizenship is known*. Column 2 gives the number who are U.S. citizens and column 3 the percentage that this represents. In Table 6 the number in column 2 of Table 5 is further divided into men and women. Note that in both tables *all years prior to* 1982-1983 include doctorates granted by computer science departments.

TABLE 5: U.S. Citizen Doctorates

	Adjusted Total of Doctorates given by U.S. universities	Total of Doctorates who are U.S. citizens	%
1973-1974	938	677	72%
1974-1975	999	741	74%
1975-1976	965	722	75%
1976-1977	901	689	76%
1977-1978	868	634	73%
1978-1979	806	596	74%
1979-1980	791	578	73%
1980-1981	839	567	68%
1981-1982	798	519	65%
1982-1983	744	455	61%
1983-1984	738	433	59%
1984-1985	726	396	55%
1985-1986	755	386	51%
1986-1987	739	362	49%
1987-1988	798	363	45%
1988-1989	884	411	46%

Graph for Table 5: U.S. Citizen Doctorates
Total of Doctorates by Percent



Graph for Table 5: U.S. Citizen Doctorates

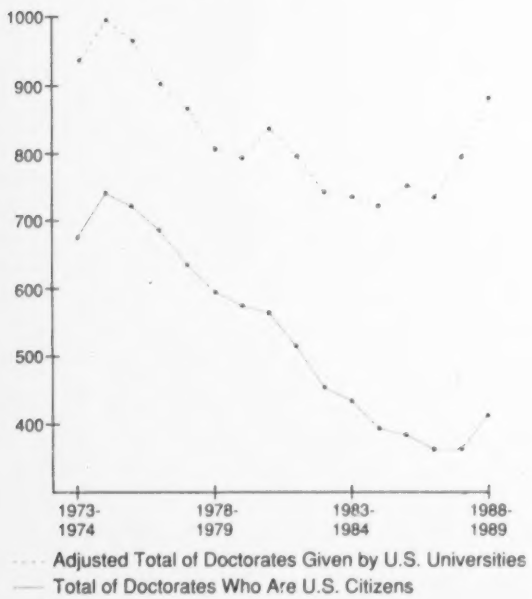


TABLE 6: U.S. Citizen Doctorates, Male and Female

	Doctorates who are U.S. Citizens	Male	Female	% Female
1973-1974	677	618	59	9%
1974-1975	741	658	83	11%
1975-1976	722	636	86	12%
1976-1977	689	602	87	13%
1977-1978	634	545	89	14%
1978-1979	596	503	93	16%
1979-1980	578	491	87	15%
1980-1981	567	465	102	18%
1981-1982	519	431	88	17%
1982-1983	455	366	89	20%
1983-1984	433	346	87	20%
1984-1985	396	315	81	20%
1985-1986	386	304	82	21%
1986-1987	362	289	73	20%
1987-1988	363	287	76	21%
1988-1989	411	313	98	24%

Concluding Remarks

We view with guarded optimism the small increase in the number of U.S. citizens receiving doctorates in the mathematical sciences. It is encouraging to note the increase in the number of women among the new doctorates, but it remains to be seen if this gain can be sustained. Perhaps the proportionately large number of women new doctorates hired by the Group B departments, the wellspring of American mathematics, will result in larger numbers of women enrolling in graduate programs (35% of the new doctorates hired by Group B departments were women).

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Salary Survey for New Recipients of Doctorates, 1988-1989

The figures for 1989 were compiled from questionnaires sent to individuals who received a doctorate in the mathematical sciences during the 1988-1989 academic year from universities in the United States and Canada.

Questionnaires requesting information on salaries and professional experience were distributed to 769 recipients of degrees using addresses provided by the departments which granted the degrees. Of these, 8 were returned by the postal service as undeliverable and could not be forwarded. There were 406 individuals who returned forms between late June and early September. The tables below are based on the responses from 351 of these individuals (269 men and 82 women). Data from 55 responses were not used in the compilation of the tables below; forms with insufficient data, or from individuals who had indicated they had part-time employment, were not yet employed, or were not seeking employment were considered unusable.

Readers should be warned that the data in this report are obtained from a self-selected sample and inferences from them may not be representative of the population. For more comprehensive information on the recipients of new doctorates granted last year in the mathematical sciences in the U.S. and Canada, see the preceding article by E. Connors.

Key to Tables. *Salaries* are listed in hundreds of dollars. *Years* listed refer to the academic year in which the doctorate was received. *M* and *F* are Male and Female respectively. *One year experience* means that the persons had experience limited to one year or less in the same position or a position similar to the one reported; some persons receiving a doctorate had been employed in their present position for several years. $(X + Y)$ means there are *X men and Y women* in the 1989 sample. Quartile figures are given only in cases where the number of responses is large enough to make them meaningful.

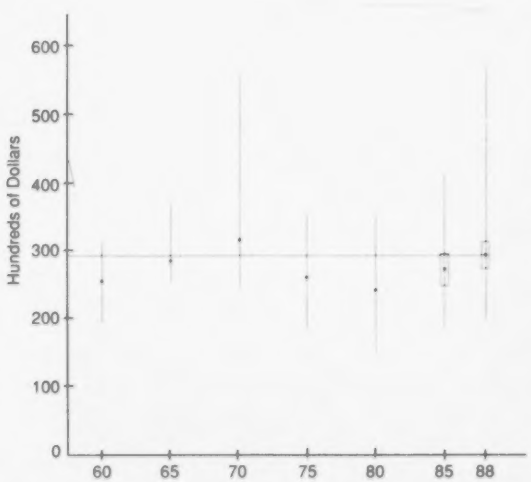
Graphs. The horizontal line represents the median salary for 1988 in hundreds of dollars. The points plotted are the relevant data for each year converted to 1988 dollars using the implicit price deflator prepared annually by the Bureau of Economic Analysis, U.S. Department of Commerce. Where available, first and third quartiles appear as boxes along the vertical lines. (Because the deflator is not yet available for this year, the 1989 figures do not appear on the graphs.)

Note that salaries for teaching, or teaching and research, have yet to return to their high point of 1970, although steady progress has been made since 1980. (For further details, see Donald Rung's article, "A Fifteen Year Retrospective on Academic Salaries of U.S. Doctorate Holding Faculty," in the November 1985 issue of *Notices*, pp. 772-773.)

Nine-Month Salaries

Ph.D. Year	Min	Q_1	Median	Q_3	Max	Reported Median in 1988 $
TEACHING OR TEACHING AND RESEARCH (162 + 35)						
1960	49		65		80	255
1965	70		80		105	287
1970	85		110		195	318
1975	90	120	128	135	173	262
1980	105	155	171	185	250	242
1984	140	215	230	255	380	259
1985	170	23	250	270	380	272
1986	170	250	269	290	400	287
1987	165	260	280	300	517	289
1988	200	275	293	314	575	293
1989	200	290	310	330	478	—
1986M	170	250	269	290	400	
1986F	230	250	268	294	270	
1987M	165	260	280	300	517	
1987F	230	251	280	325	420	
1988M	200	274	290	315	520	
1988F	216	275	299	314	575	
1989M	200	290	305	330	478	
1989F	220	295	310	330	470	
One Year Experience (145 + 43)						
1989M	200	290	303	330	470	
1989F	220	290	310	325	450	

Nine-Month Teaching



Nine-Month Salaries

Ph.D. Year	Min	Median	Max	Reported Median in 1988 $
		RESEARCH (6 + 0)		
1960	52	65	80	255
1965	71	81	90	291
1970	78	105	160	303
1975	100	—	110	—
1980	125	137	180	194
1984	205	205	205	231
1985	205	235	250	257
1986	215	245	280	261
1987	250	300	300	309
1988	260	280	385	280
1989	235	270	330	—
1986M	215	250	280	
1986F	240	240	240	
1987M	250	300	300	
1987F	—	—	—	
1988M	260	280	385	
1988F	—	—	—	
1989M	235	270	330	
1989F	—	—	—	
One Year Experience (6 + 0)				
1989M	235	270	330	
1989F	—	—	—	

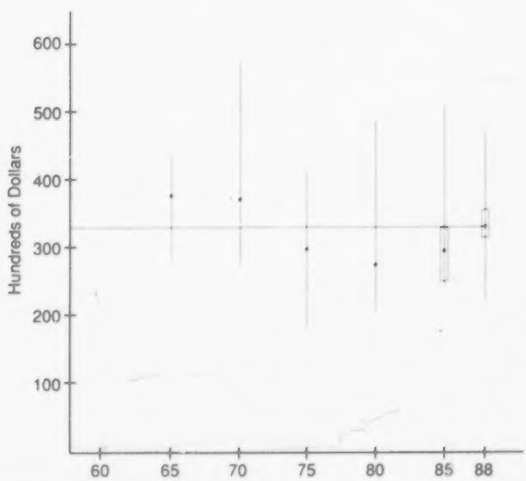
Nine-Month Research

Graph omitted because sample size too small.

Twelve-Month Salaries

Ph.D. Year	Min	Q_1	Median	Q_3	Max	Reported Median in 1988 $
			TEACHING OR TEACHING AND RESEARCH (40 + 14)			
1960	.....		NO DATA		.....	
1965	78		104		121	373
1970	95		128		200	370
1975	87		145		204	297
1980	143		195		350	276
1984	134		260		450	293
1985	220	230	273	300	470	299
1986	220	265	320	360	480	341
1987	200	283	315	357	520	325
1988	220	313	330	360	480	330
1989	238	290	315	370	620	—
1986M	220	270	321	360	480	
1986F	240	245	285	340	360	
1987M	200	270	300	358	520	
1987F	300	320	339	357	450	
1988M	220	308	330	355	480	
1988F	329	335	350	365	441	
1989M	238	295	315	370	620	
1989F	275	290	314	380	435	
One Year Experience (34 + 10)						
1989M	260	300	318	370	495	
1989F	275	290	320	380	435	

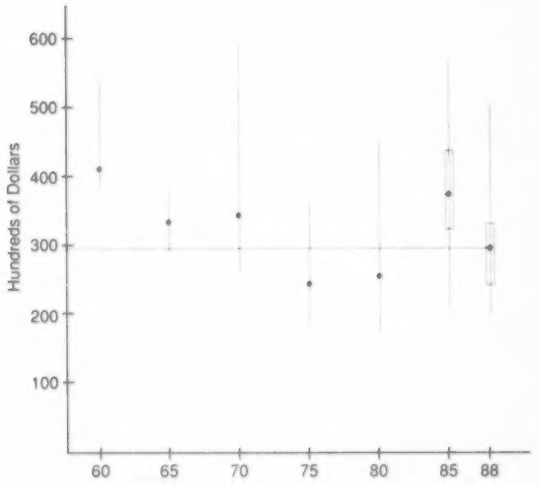
Twelve-Month Teaching



Twelve-Month Salaries

Ph.D. Year	Min	Q_1	Median	Q_3	Max	Reported Median in 1988 $
			RESEARCH (19 + 7)			
1960	97		105		140	412
1965	81		93		107	334
1970	90		120		205	347
1975	90		119		180	243
1980	120		180		321	255
1984	145		261		415	294
1985	190	295	342	400	520	374
1986	160	240	300	325	510	296
1987	200	260	287	337	430	320
1988	200	245	295	331	505	295
1989	180	250	317	385	623	—
1986M	160	240	300	330	510	
1986F	240	240	270	300	300	
1987M	200	250	282	337	400	
1987F	300	308	316	373	430	
1988M	200	240	280	330	505	
1988F	280	320	330	350	360	
1989M	180	250	300	393	623	
1989F	200	295	350	373	400	
One Year Experience (16 + 7)						
1989M	180	250	300	361	522	
1989F	200	295	350	373	400	

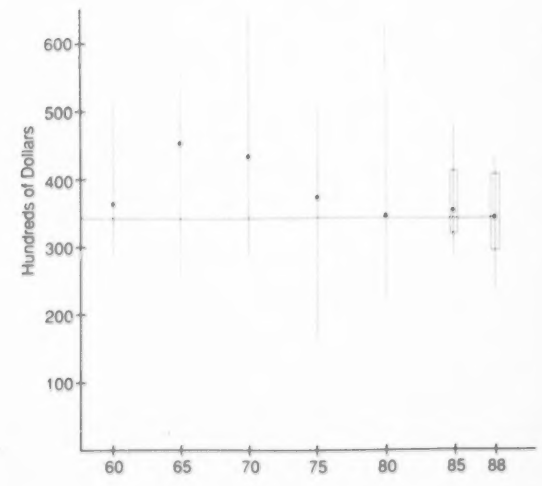
Twelve-Month Research



Twelve-Month Salaries

Ph.D. Year	Min	Q_1	Median	Q_3	Max	Reported Median in 1988 $
			GOVERNMENT (10 + 0)			
1960	72		93		130	365
1965	70		126		160	452
1970	100		150		223	433
1975	78		182		247	372
1980	156		244		501	345
1984	140		315		490	355
1985	263	294	325	381	440	356
1986	270	330	400	449	610	426
1987	200	290	360	465	500	371
1988	240	298	343	405	436	343
1989	330	363	378	438	540	—
1986M	270	330	400	449	610	
1986F	—	—	—	—	—	
1987M	200	290	360	465	500	
1987F	—	—	—	—	—	
1988M	240	290	332	360	436	
1988F	380	380	405	430	430	
1989M	330	363	378	438	540	
1989F	—	—	—	—	—	
One Year Experience (7 + 0)						
1989M	330	367	375	403	540	
1989F	—	—	—	—	—	

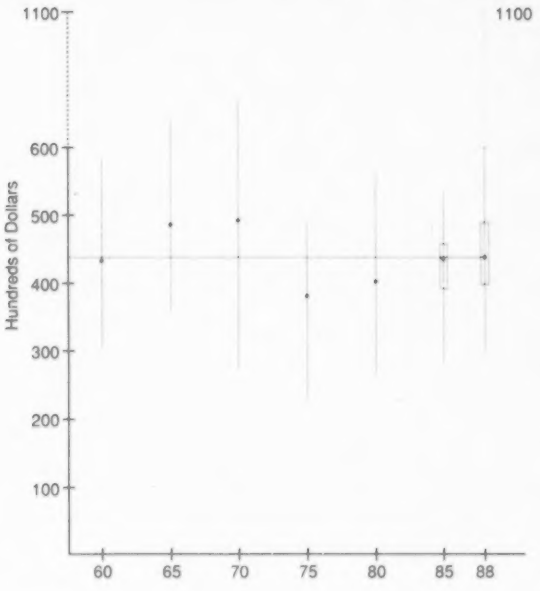
Twelve-Month Government



Twelve-Month Salaries

Ph.D. Year	Min	Q_1	Median	Q_3	Max	Reported Median in 1988 $
BUSINESS AND INDUSTRY (32 + 8)						
1960	78		110		150	432
1965	100		136		180	488
1970	96		170		235	491
1975	114		187		240	383
1980	190		284		400	402
1984	180		378		660	426
1985	260	360	400	420	493	438
1986	324	373	425	477	750	453
1987	290	400	451	500	1500	464
1988	300	400	440	490	1100	440
1989	250	420	464	505	5250	—
1986M	324	390	453	492	750	
1986F	350	357	375	400	440	
1987M	290	400	465	517	1500	
1987F	300	394	424	466	502	
1988M	300	400	431	490	1100	
1988F	375	437	454	495	660	
1989M	250	420	464	513	5250	
1989F	375	430	470	500	516	
One Year Experience (17 + 7)						
1989M	250	420	450	510	580	
1989F	375	430	480	500	516	

Twelve-Month Industry



Faculty Status Survey

Salaries

The questionnaire sent to departments in the mathematical sciences this year was substantially changed from previous years. Departments were asked to report the number of faculty whose academic-year salaries fell within given salary intervals. The charts on the following four pages display data for all eight groups - faculty salaries by rank, mean salaries by rank, the number within that rank, and the number of usable returns for the group. Note that we no longer collect or report salary information for two years. See Tables on the following pages.

Age

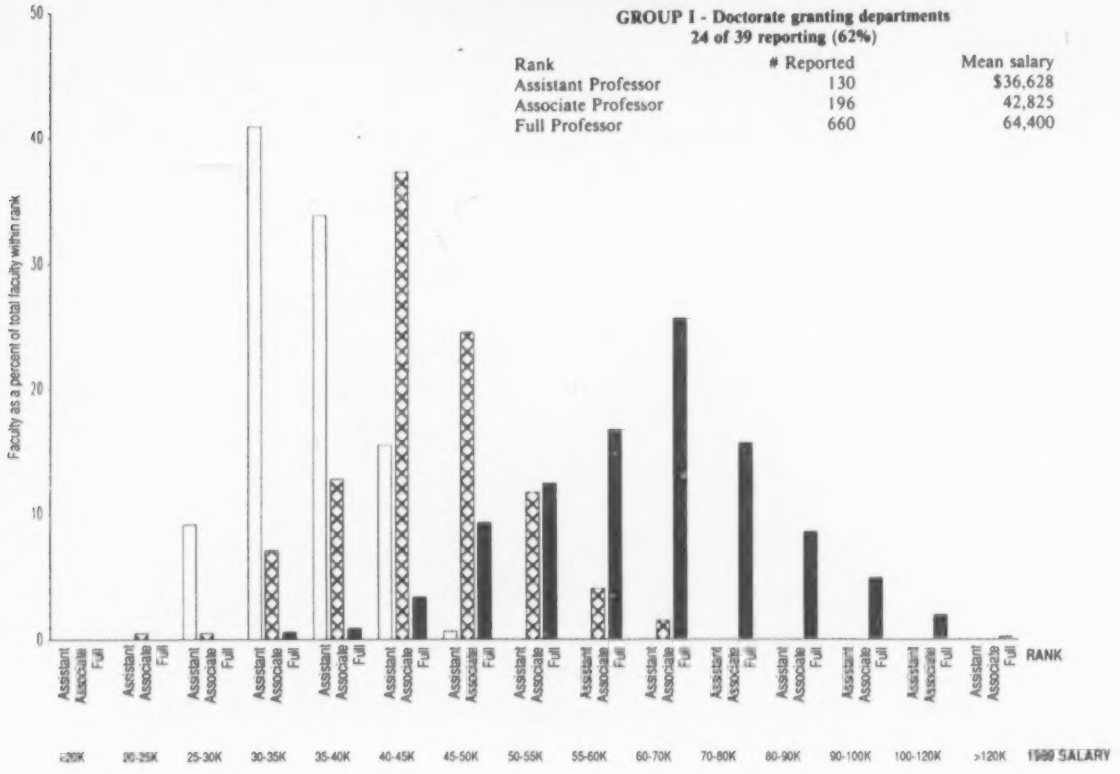
Age data collected on the Faculty Status questionnaire will be reported in the Second Report in a spring 1990 issue of *Notices*, with other departmental information currently being collected.

Acknowledgement

The Annual AMS-MAA Survey attempts to provide an accurate appraisal and analysis of various aspects of the academic mathematical scene vital to the entire mathematical community. Yearly, collegiate departments in the United States, and the doctorate-granting departments in Canada, are provided the opportunity to respond. The quantity and quality of the responses directly determine the quality of the information in these reports. Without the dedicated cooperation of the secretarial and administrative support staff in the mathematical science departments we would not be able to conduct a survey, nor be confident in our analysis of its results. We are, unfortunately, unable to thank personally all the departmental assistants for their cooperation, but it is nonetheless appreciated. However, we are able to thank the administrative support staff of the AMS, especially Marcia Almeida, Monica Foulkes, and James W. Maxwell, whose efforts are acknowledged and appreciated.

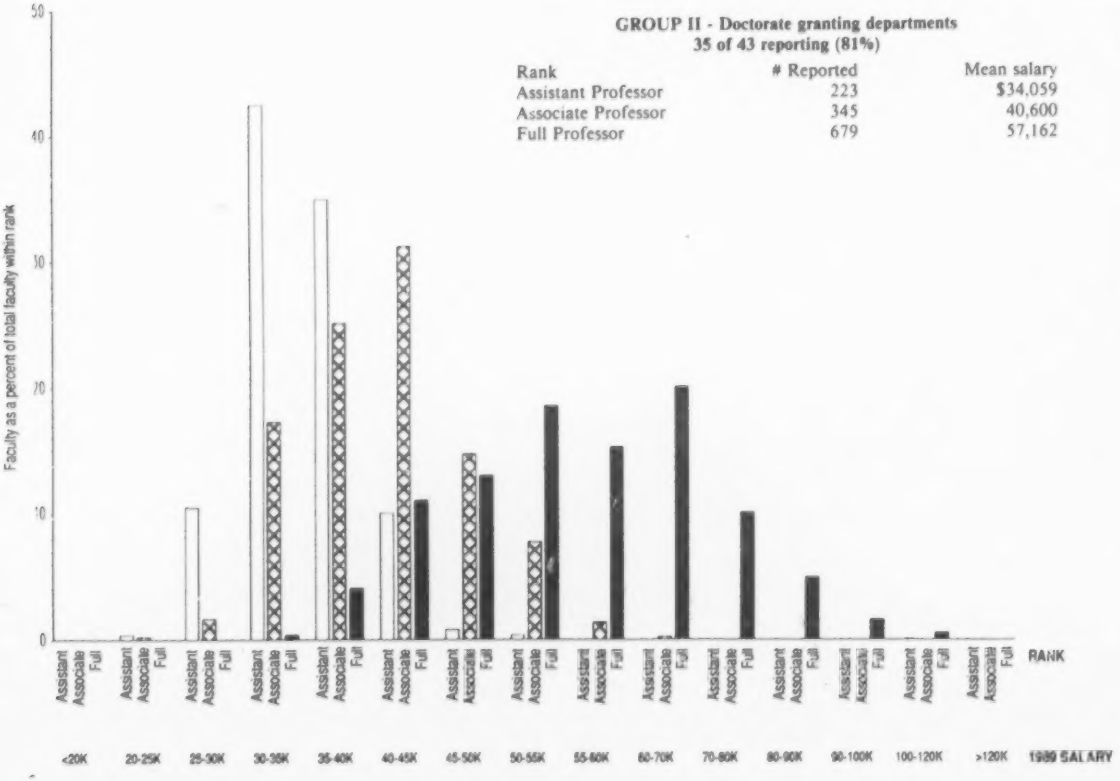
GROUP I - Doctorate granting departments
24 of 39 reporting (62%)

Rank	# Reported	Mean salary
Assistant Professor	130	$36,628
Associate Professor	196	42,825
Full Professor	660	64,400



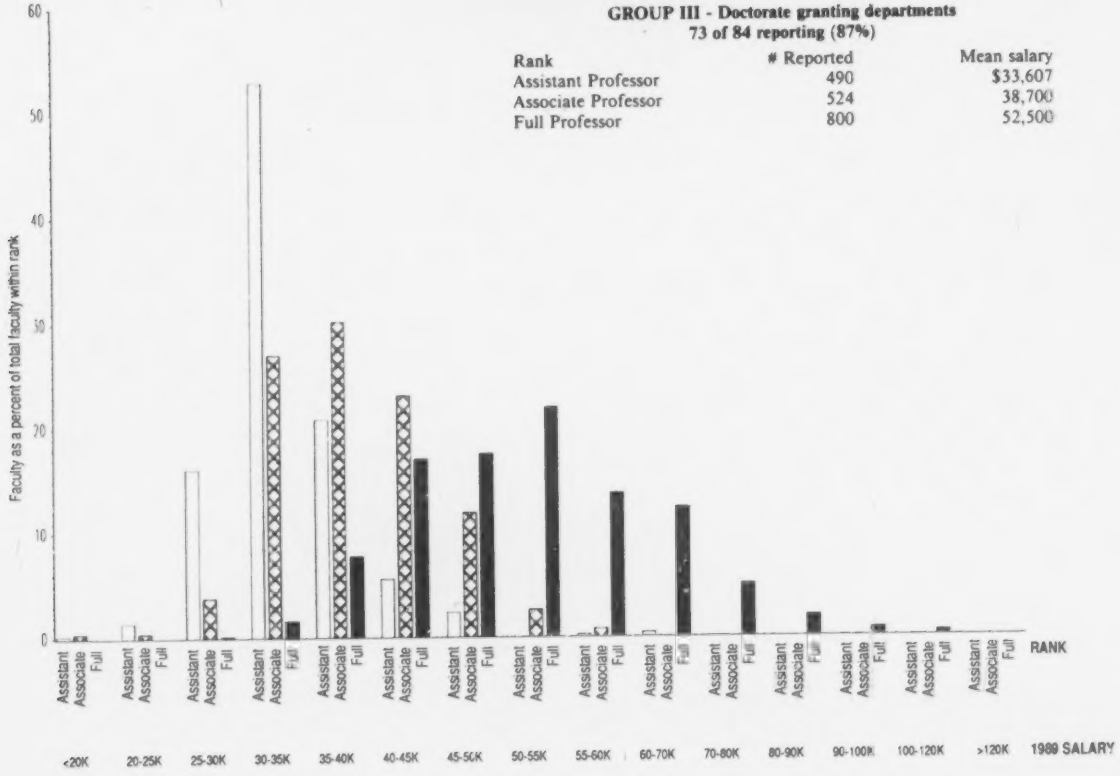
GROUP II - Doctorate granting departments
35 of 43 reporting (81%)

Rank	# Reported	Mean salary
Assistant Professor	223	$34,059
Associate Professor	345	40,600
Full Professor	679	57,162



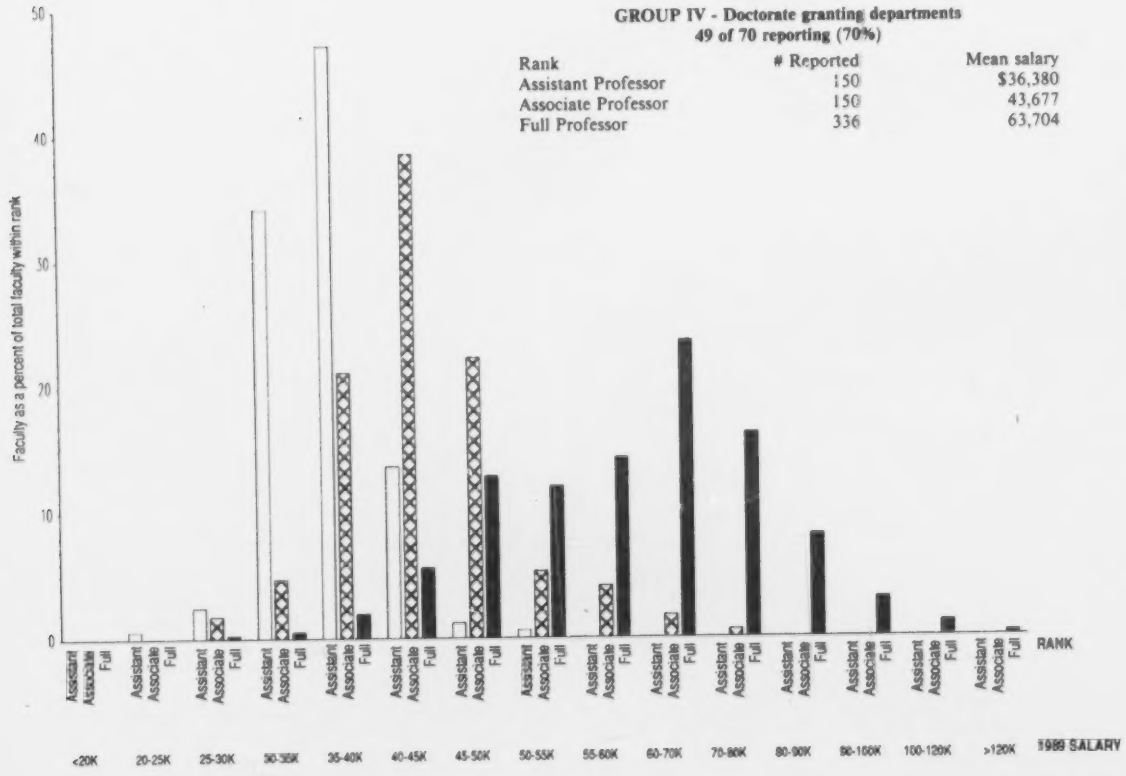
GROUP III - Doctorate granting departments
73 of 84 reporting (87%)

Rank	# Reported	Mean salary
Assistant Professor	490	$33,607
Associate Professor	524	38,700
Full Professor	800	52,500



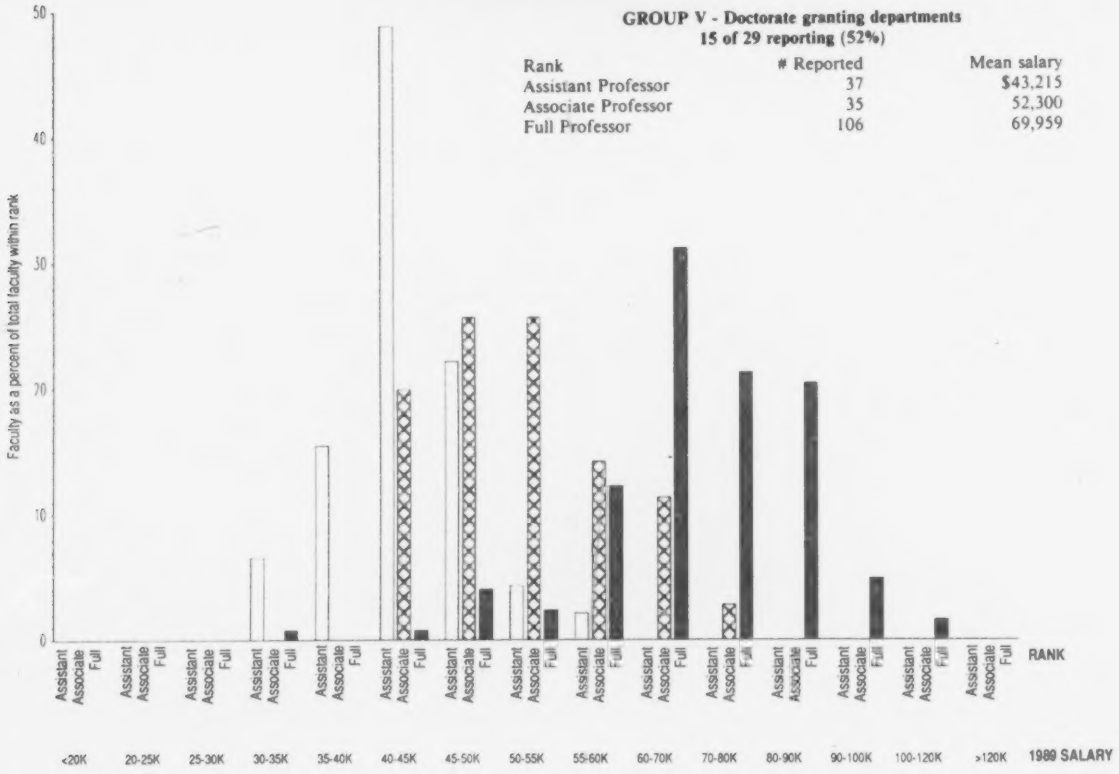
GROUP IV - Doctorate granting departments
49 of 70 reporting (70%)

Rank	# Reported	Mean salary
Assistant Professor	150	$36,380
Associate Professor	150	43,677
Full Professor	336	63,704



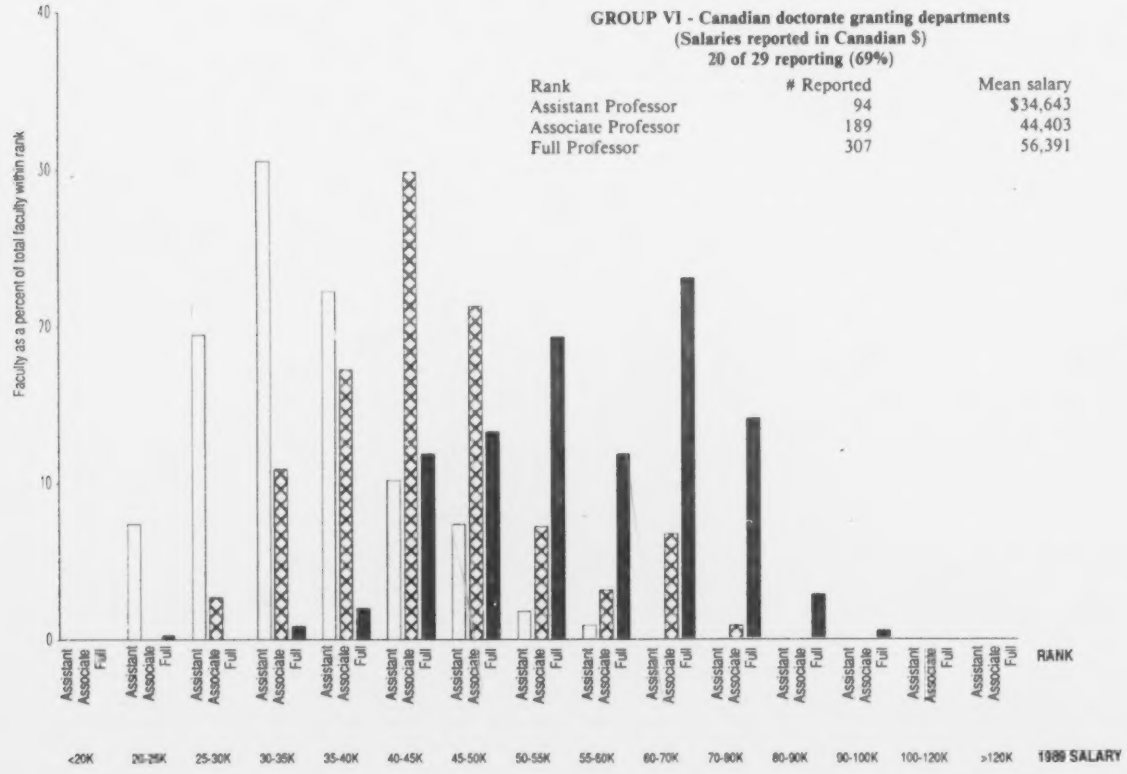
GROUP V - Doctorate granting departments
15 of 29 reporting (52%)

Rank	# Reported	Mean salary
Assistant Professor	37	$43,215
Associate Professor	35	52,300
Full Professor	106	69,959



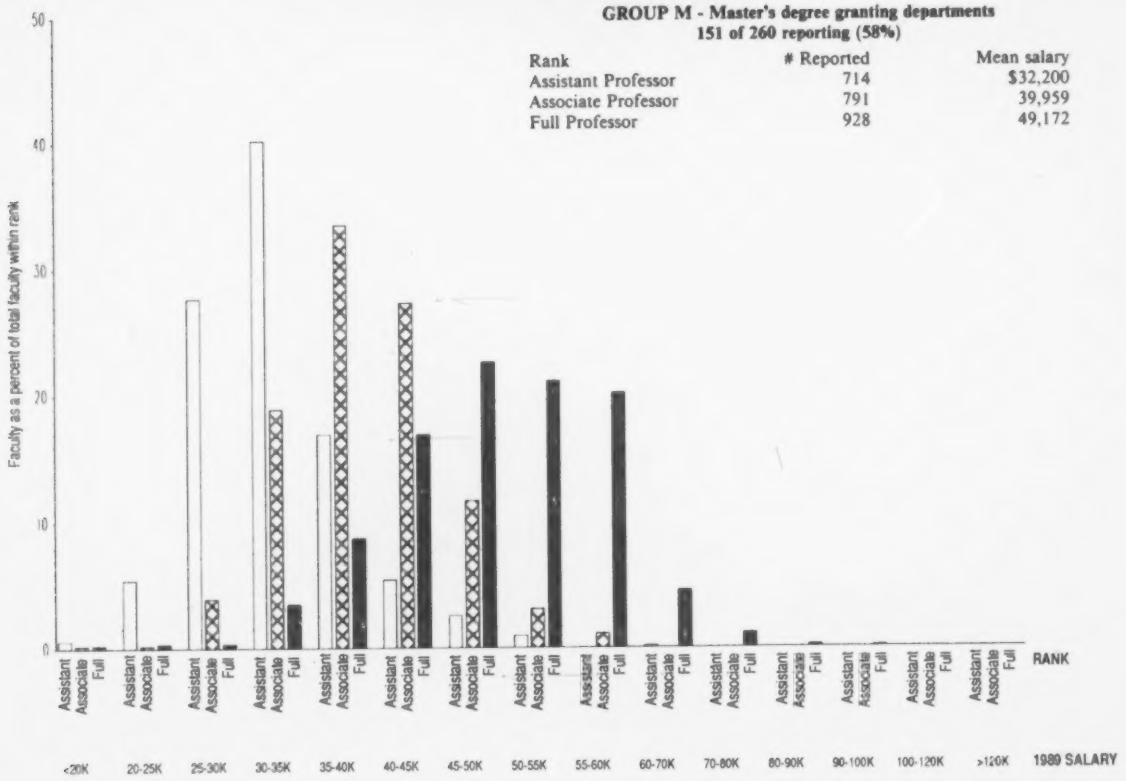
GROUP VI - Canadian doctorate granting departments
(Salaries reported in Canadian $)
20 of 29 reporting (69%)

Rank	# Reported	Mean salary
Assistant Professor	94	$34,643
Associate Professor	189	44,403
Full Professor	307	56,391



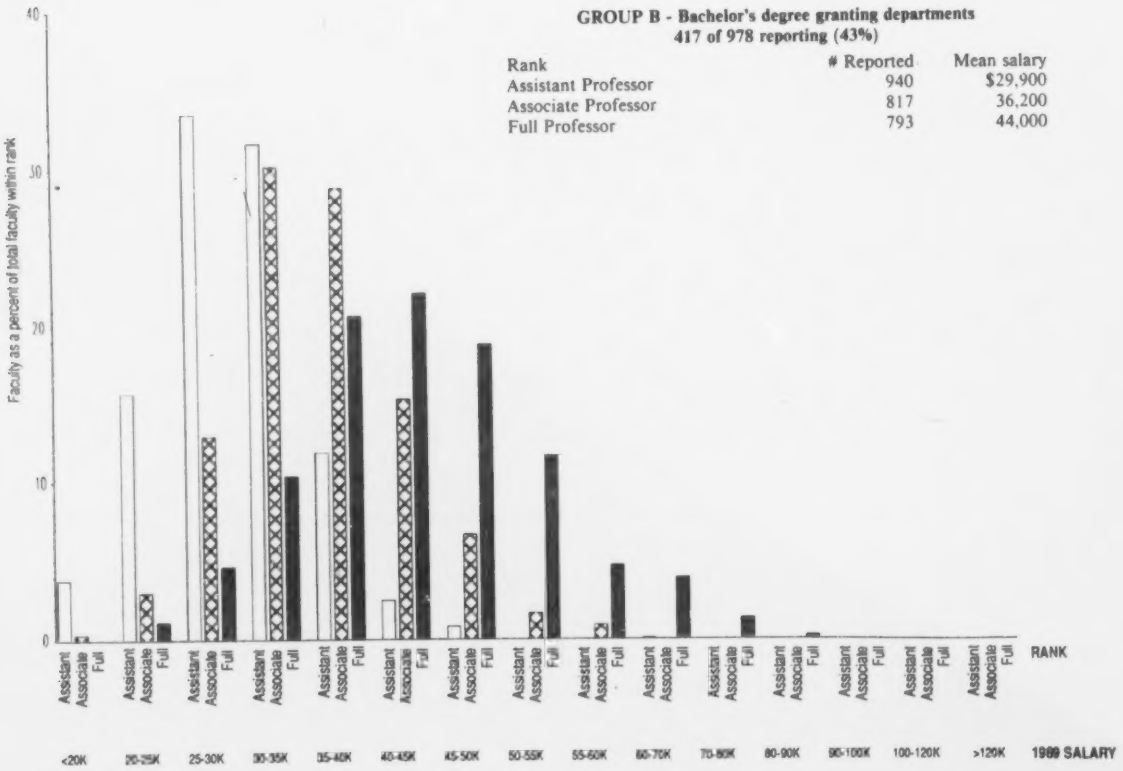
GROUP M - Master's degree granting departments
151 of 260 reporting (58%)

Rank	# Reported	Mean salary
Assistant Professor	714	$32,200
Associate Professor	791	39,959
Full Professor	928	49,172



GROUP B - Bachelor's degree granting departments
417 of 978 reporting (43%)

Rank	# Reported	Mean salary
Assistant Professor	940	$29,900
Associate Professor	817	36,200
Full Professor	793	44,000



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1989 Annual AMS-MAA Survey

(Second Report)

Enrollments, Faculty Characteristics,
and Update on New Doctorates, Fall 1989

Edward A. Connors

Highlights

1. *The final (spring) count of new doctorates in the mathematical sciences records 419 U.S. citizens among the 919 recipients of doctorates granted by U.S. institutions from July 1, 1988 through June 30, 1989. These U.S. citizens account for only 46% of the new mathematical sciences doctorates awarded by U.S. institutions.*
2. *The number of U.S. citizens receiving doctorates in 1988-1989 is less than 60% of the comparable number for a range of years in the mid-1970s.*
3. *Women received 24% of the doctorates in mathematical sciences awarded to U.S. citizens. This is the largest percentage ever and a significant increase over the 20-21% awarded in the last six years. The 100 doctorates awarded to women U.S. citizens in 1988-1989 is exceeded only by the 102 awarded in 1980-1981.*
4. *Slightly less than 1.5% of the fall 1988 full-time faculty in the mathematical sciences, Groups I, II and III combined, retired or died by the fall of 1989. (See box on this page for descriptions of the groupings used in this Survey.) Slightly less than 1.75% of the fall 1988 full-time faculty in Groups M and B retired or died by fall 1989.*
5. *One-third of the current full-time faculty at departments that responded to the Survey will have died or reached age 65 by the year 2005.*
6. *A substantial portion of the upper division (junior/senior) mathematics majors are women: 46% in each of Groups M and B, 39% in Groups I, II and III combined.*

A first report of the 1989 Survey appeared in the November 1989 *Notices*, pages 1155-1188, with corrections in the December 1989 *Notices*, page 1372. It included a report on the 1988-1989 new doctorates, starting salaries, faculty salaries, and a list of the names and thesis titles of the 1988-1989 doctorates. A supplementary list of 1988-1989 doctorates appeared in the May/June issue of *Notices*.

The 1989 Annual AMS-MAA Survey represents the thirty-third in an annual series begun in 1957 by the Society. The 1989 Survey was under the direction of the AMS-MAA Committee on Employment and Educational Policy (CEEP), whose members were: Donna L. Beers, Morton Brown, Stefan A. Burr, Edward A. Connors (chair), Philip C. Curtis, Jr., David J. Lutzer, and James J. Tattersall. The questionnaires were devised by CEEP's Data Subcommittee whose members were: Edward A. Connors (chair), Lincoln K. Durst (consultant), John D. Fulton, James F. Hurley, Charlotte Lin, Don O. Loftsgaarden, David J. Lutzer, James W. Maxwell (ex officio), Donald E. McClure, and Donald C. Rung. As of January 1990 the subcommittee became a standing AMS-MAA committee. Comments or suggestions regarding the Annual Survey may be directed to members of the new AMS-MAA Data Committee.

Groups I and **II** include the leading departments of mathematics in the U.S. according to the 1982 assessment of Research-Doctorate Programs conducted by the Conference Board of Associated Research Councils in which departments were rated according to the quality of their graduate faculty.[1]

Group I is composed of 39 departments with scores in the 3.0–5.0 range.

Group II is composed of 43 departments with scores in the 2.0–2.9 range.

Group III contains the remaining U.S. departments reporting a doctoral program.

Group IV contains U.S. departments (or programs) of statistics, biostatistics and biometrics reporting a doctoral program.

Group V contains U.S. departments (or programs) in applied mathematics/applied science, operations research and management science which report a doctoral program.

Group Va is applied mathematics/applied science; **Group Vb** is operations research and management science.

Group VI contains doctorate-granting departments (or programs) in the mathematical sciences in Canadian universities.

Group M contains U.S. departments granting a master's degree as the highest graduate degree.

Group B contains U.S. departments granting a baccalaureate degree only.

[1] These findings were published in *An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences*, edited by Lyle V. Jones, Gardner Lindzey, and Porter E. Coggeshall, National Academy Press, Washington, D.C., 1982. The information on mathematics, statistics and computer science was presented in digest form in the April 1983 issue of *Notices*, pages 257–267, and an analysis of the above classifications was given in the June 1983 *Notices*, pages 392–393. For a listing of departments in Groups I and II see April 1988 *Notices*, pages 532-533.

I. Introduction

We present several items of general and specific interest to the mathematical community and its observers. Our analysis is based on the data gathered in the 1989 Annual AMS-MAA Survey. As is customary we begin with an update on the employment status of the 1988-1989 class of new doctorates in the mathematical sciences. We then turn our attention to some of the information obtained from the departmental responses to the Departmental Profile Survey, and to the distribution of faculty by age section of the Faculty Status Survey. The data on faculty age is a new feature which we intend to repeat on a regular basis, perhaps biennially. We have discontinued our collection and analysis of faculty flow and mobility data (to the delight, undoubtedly, of numerous departmental assistants, heads, chairs, and, to be sure, of this author).

As in last year's report, we choose not to extrapolate from the raw data and thus we do not provide estimates of various faculty populations or course enrollments. Instead, we focus on faculty retirement and death rates (Table 3A), faculty composition by sex (Tables 3B and 3C), percentage change in faculty composition (Tables 3D and 3E), faculty age distribution (Table 3F and Figures 1-6), percentage changes in enrollments from fall 1988 to fall 1989 (Tables 4A and 6), undergraduate enrollment distribution patterns (Table 4B), percentages of women among junior/senior mathematics majors and graduate students (Tables 5 and 7), and percentages of U.S. citizens among graduate students (Table 8). The 1990 Survey of the Conference Board on the Mathematical Sciences (CBMS) will provide hard estimates of various faculty populations and course enrollments in the mathematical sciences, based on data gathered for fall 1990.

Finally we direct your attention to the information on response rates at the end of this report, and to the bibliography, which is a comprehensive and current compendium of references on data sources and recent reports in the mathematical sciences, science and engineering.

II. Update on the 1988-1989 New Doctorates

In the First Report of this Survey (November 1989 issue of *Notices*, pages 1155-1168) we reported a fall count of 904 new doctorates in the mathematical sciences granted by U.S. universities (since then increased to 905 because of a late departmental correction). We now update the fall counts to produce the 1988-1989 spring counts: 919 doctorates in the mathematical sciences awarded by U.S. institutions, and 62 awarded by Canadian institutions. Fall and spring counts for the last five years are given in Table 1.

Of the 919 doctorates awarded by U.S. universities, citizenship status was reported as known for 896, 419 of whom were U.S. citizens (319 men and 100 women). The 62 Canadian doctorates went to 54 men and 8 women.

TABLE 1: New Doctorates, Fall and Spring Counts

	84-85		85-86		86-87		87-88		88-89	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
U.S.	732	765	756	782	779	808	804	828	905*	919
Canada	37	42	45	45	66	66	52	55	53	62
Total	769	807	801	827	845	874	856	883	958*	981

*Increased from the fall count reported in the November 1989 *Notices*.

Employment data for new doctorates are updated in Tables 2A, 2B and 2C. We do not, however, include the additional new doctorates in our updated employment matrices. 18% of the new doctorates reported taking foreign academic or nonacademic employment (compared to 20% for 1987-1988 doctorates). By spring 1990 7% of new doctorates were either not seeking employment, were not yet employed, or their status was unknown (compared with 5% for 1987-1988 doctorates in the spring of 1989). 11.5% of the new doctorates were hired by Group B institutions (compared with 8% for 1987-1988 doctorates, and an average of 8.6% for the previous six years).

The research fields of the new doctorates continue to have an applied flavor (see Table 2C). For the last seven years half, or nearly half, of the new doctorates specialized in statistics, applied mathematics, operations research or computer science. 27% of the 1988-1989 new doctorates reported statistics as the field of thesis.

Finally, we note that the names of the 1988-1989 new doctorates and their thesis titles were published in *Notices* (November 1989 issue and a supplemental list in the May/June 1990 issue).

III. Faculty Characteristics

Two separate surveys provide the data reported in this section. Tables 3A through 3D are produced by responses to the Departmental Profile Survey conducted in fall 1989; Table 3F and Figures 1-5 are produced by responses to the Faculty Status Survey conducted in spring 1989.

In Table 3A we provide the attrition rates of full-time faculty in the mathematical sciences. The numbers we report are obtained from the departmental response to our request for the number of full-time faculty in fall 1988 as well as the number of these who had permanently retired or died by fall 1989. Note the differences among Groups I, II and III (comparable rates in last year's report were 1.26%, 1.65% and 1.76% respectively). Groups I, II and III combined yield a rate of 1.43% (compared to 1.57% last year). The 1.72% for Groups M and B combined is the same as last year's rate.

In last year's report we promised to "ascertain more information on age distribution of full-time faculty and thus better analyze the greying of the contemporary mathematical sciences faculty". Our data for 1989 are

TABLE 2A: Employment Status of 1988–1989 New Doctorates in the Mathematical Sciences

Type of Employer	Algebra and Number Theory	Real and Complex Analysis	Geometry and Topology	Logic	Probability and Statistics	Applied Mathematics	Discrete Mathematics and Combinatorics	Numerical Analysis	Linear and Nonlinear Optimization	Other	Total
Group I	15	32	24	8	4	18		3		3	107
Group II	8	8	7	2	5	14	2	1	1		48
Group III	11	11	4		10	8	1	5	1	3	54
Group IV	1				32						33
Group V					4	7			1	2	14
Masters	8	16	9	2	14	21	4	3	1	3	83
Bachelors	21	21	15	1	19	9	12	1	2	9	110
Two-year Colleges	2	1	2		1	2		1			9
Other Academic Departments	2		3		25	13	2	5	8	12	70
Research Institutes	3	2	8		6	3		2		2	26
Government	1	1			9	6			1	1	19
Business and Industry	1	4	5	4	48	17	1	3	9	8	100
Canada, Academic	2	8	1		12	2	4	1			30
Canada, Nonacademic			1		2	4					7
Foreign, Academic	19	23	20	1	41	28	7	4	6	6	155
Foreign, Nonacademic		2	2	1	5	5		1	3	3	22
Not seeking employment	1	1	3		3	2	1	2			13
Not yet employed (Spring 1990)	3	2	4	1	9	4		2	1	3	29
Unknown	2	8	3	2	8	2		3		1	29
Total	100	142	111	22	257	165	34	37	34	56	958

TABLE 2B: Employment Status of 1988–1989 New Doctorates in the Mathematical Sciences Females Only

Type of Employer	Algebra and Number Theory	Real and Complex Analysis	Geometry and Topology	Logic	Probability and Statistics	Applied Mathematics	Discrete Mathematics and Combinatorics	Numerical Analysis	Linear and Nonlinear Optimization	Other	Total
Group I	1	3	1	2	1	1					9
Group II	1	3	2	1	1	2					10
Group III	2		1		2			1	1		7
Group IV					8						8
Group V					1	2				1	4
Masters	2	5	2	1	4	5	1				20
Bachelors	6	3	5		4	8	7			5	38
Two-year Colleges	2	1			1						4
Other Academic Departments					7	3		1	2	1	14
Research Institutes		1			1	1					3
Government					2	1					3
Business and Industry			2		15	1		1	3		22
Canada, Academic			1		3						4
Canada, Nonacademic											
Foreign, Academic		3	5		7	4				1	20
Foreign, Nonacademic											
Not seeking employment			3		1						4
Not yet employed (Spring 1990)		1	1		5			1			8
Unknown					1					1	2
Total	14	20	23	4	64	28	8	4	6	9	180

Table 2C: Fields of New Doctorates

	Year Surveyed					
	1983–1984	1984–1985	1985–1986	1986–1987	1987–1988	1988–1989
Number (Fall Count)	789	769	801	845	856	958
Specialty:						
Applied Math	110 (14%)	115 (15%)	149 (19%)	142 (17%)	142 (17%)	165 (17%)
Statistics	173 (22%)	189 (25%)	171 (21%)	182 (22%)	173 (20%)	257 (27%)
Operations Research	66 (8%)	41 (5%)	62 (8%)	51 (6%)	59 (7%)	34 (3%)
Computer Science	20 (3%)	15 (2%)	16 (2%)	18 (2%)	16 (2%)	37 (4%)
Total	369 (47%)	360 (47%)	398 (50%)	393 (47%)	393 (46%)	493 (51%)

presented in Table 3F and, in graphical form, in Figures 1-5. Similar data for the years 1975 and 1985 for academic Ph.D. scientists and engineers are presented in Figure 6. See also [27] page 64, Figure 5.9, and page 117, Figure A5.9.

Table 3A: Faculty Attrition*

Group	Full-time Faculty
	%
I	.96
II	1.40
III	1.88
I+II+III	1.43
IV	1.33
V	.73
M	1.75
B	1.69
M+B	1.72

*Percentage of full-time faculty who were in the department in fall 1988 but were reported to have retired or died by fall 1989.

Table 3B: Percentage of Women among Doctoral Full-time Faculty, fall 1989

Groups							
I	II	III	I+II+III	IV	V	M	B
%	%	%	%	%	%	%	%
5.7	7.4	8.0	7.0	11.3	6.8	13.1	16.9

Table 3C: Percentage of Women among all Full-time Faculty, fall 1989

Groups							
I	II	III	I+II+III	IV	V	M	B
%	%	%	%	%	%	%	%
6.5	9.5	12.5	9.5	12.0	6.8	20.0	25.0

Our graphs in Figures 1-5 use 10-year intervals based on age 30, but the raw data are in 5-year spans. Some of the following comments are based on the raw data, which are available for each survey group. Groups I and V have by far the largest percentage of faculty age 35 or less (25%). The under-30 cohort accounts for 9% of the total faculty in Group I, and 6% in Group V. Group I has the largest percentage of faculty over 60 (13%). In fact, all 5-year age spans from 35-on for Group I hover around 13%, with the largest being 14% in the 45-50 age group. However, this age group (part of the silent generation) accounts for nearly 20% of the total faculty in each of the other survey groups and, indeed, in all survey groups combined. Groups I and V have nearly one quarter of their faculty at age 55. For all groups combined slightly more than one third of the total faculty is age 50 or older and thus will have either died or reached the age of 65 by the year 2005. Likewise, for all groups combined, slightly less than one fifth of the total faculty is age 55 or older.

Table 3D: Percentage Change in Doctoral Nontenured Faculty, fall 1988 to fall 1989

	Groups						
	I	II	III	I+II+III	M	B	M+B
	%	%	%	%	%	%	%
Male	+16	+10	+10	+12	+3	--	+1
Female	+96	+15	+7	+24	+17	+9	+13
Total	+21	+11	+10	+14	+5	+2	+4

Table 3E: Percentage Change in Doctoral Tenured Faculty, fall 1988 to fall 1989

	Groups						
	I	II	III	I+II+III	M	B	M+B
	%	%	%	%	%	%	%
Male	-3	--	-7	-4	+3	+3	+3
Female	-6	--	-3	-4	+7	+2	+4
Total	-3	--	-7	-4	+3	+3	+3

In Figure 3 and Table 3F we provide the age distribution of female faculty in all survey groups combined. Note that only 15% of the female faculty is age 55 or older and that the age 40-45 cohort, at 18% of the total, is the largest (and, in particular, is larger than the 45-50 age group). In Tables 3B and 3C we provide percentages of women among full-time faculty, for doctoral faculty and all faculty respectively.

Table 3F: Age distribution of mathematical sciences faculty, all groups*

	Total Faculty	Male	Female
	%	% of total males	% of total females
Under 30	5	5	8
30-35	12	12	15
35-40	13	13	16
40-45	16	15	18
45-50	20	20	15
50-55	15	16	13
55-60	11	11	8
Over 60	8	9	7

* The use of 5-year intervals in this table and 10-year intervals in Figures 1-5 results in slight differences because of rounding.

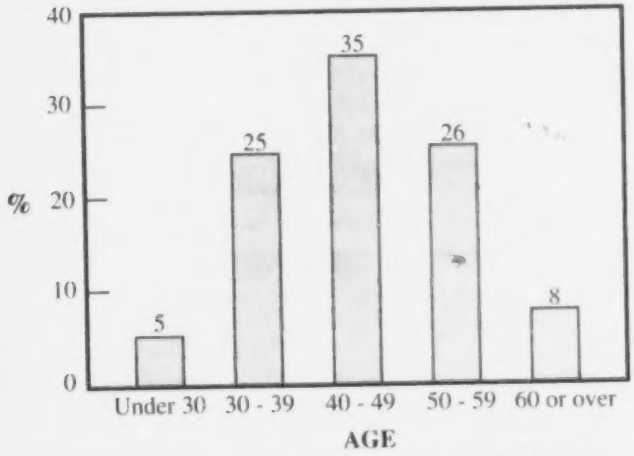

Figure 1. Age distribution of mathematical sciences faculty, all groups.

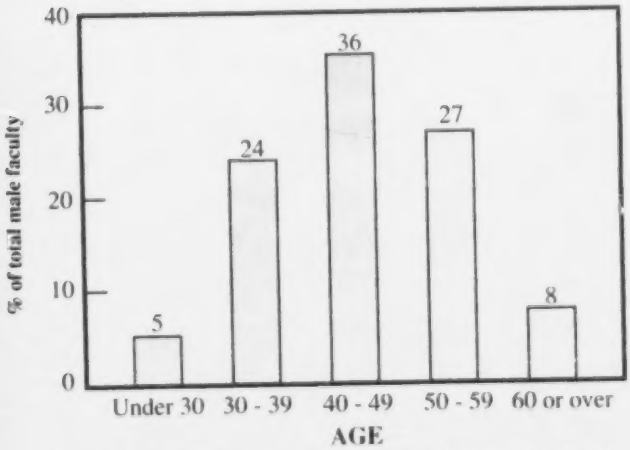

Figure 2. Age distribution of male mathematical sciences faculty all groups.

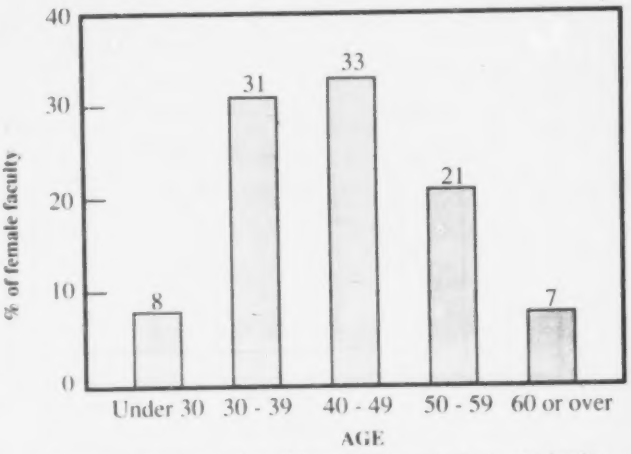

Figure 3. Age distribution of female mathematical sciences faculty, all groups.

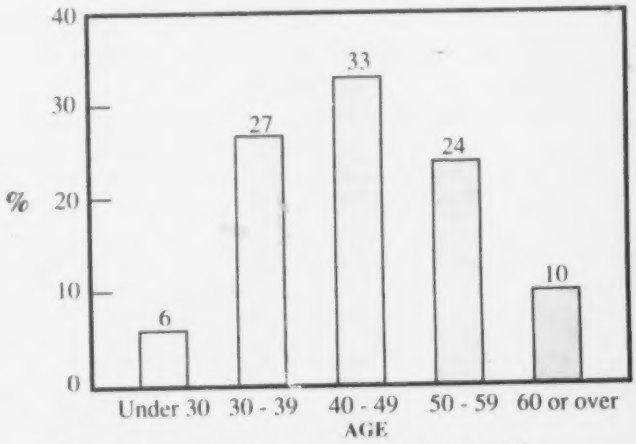

Figure 4. Age distribution of mathematical sciences faculty, Groups I, II, III.

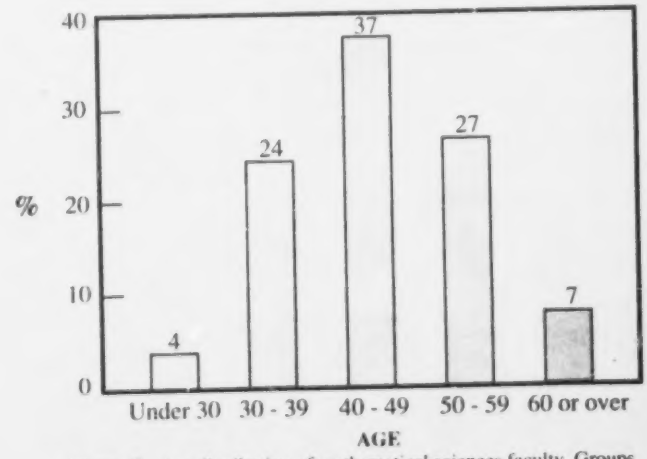

Figure 5. Age distribution of mathematical sciences faculty, Groups M and B.

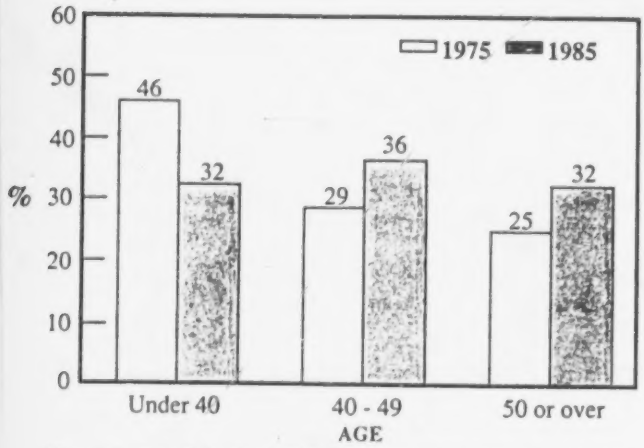

Figure 6. Age of Academic PhD Scientists and Engineers, 1975 and 1985. (Source: Commission on Professionals in Science and Technology Occasional Paper 89.3. Data Source: National Science Foundation)

IV. Undergraduate Enrollment Profile and Majors

The data in Table 4A are based on fall 1988 and fall 1989 enrollments reported on the 1989 Departmental Profile survey form, which requests two years' data on enrollments and departmental size. In particular, the comparisons in Table 4A are from the same set of respondents and do not use the results of last year's Annual Survey.

Table 4A: Percentage Change in Undergraduate Enrollments, fall 1988 to fall 1989

Groups				
I	II	III	M	B
-1%	-1%	0%	+3%	+3%

Table 4B: Undergraduate Enrollments Distribution, fall 1989

Group	Remedial Mathematics*	Remedial Mathematics + Pre-calculus	Remedial Mathematics + Pre-calculus + 1st-yr. Calculus
	%	%	%
I	9	24	60
II	7	28	59
III	11	35	58
I+II+III	10	31	59
M	15	33	49
B	19	35	49
M+B	17	34	49

*Arithmetic, high school algebra, geometry.

Table 5: Percentage of Women among Junior/Senior Majors (including double majors), fall 1989

Groups							
I	II	III	I+II+III	IV	V	M	B
%	%	%	%	%	%	%	%
36	41	42	39	43	28	46	46

V. Graduate Enrollments in the Mathematical Sciences, Sex and Citizenship

The data in Table 6 are based on fall 1988 and fall 1989 enrollments reported on the 1989 Departmental Profile survey form, which requests two years' data on enrollments and departmental size. In particular, the comparisons in Table 6 are from the same set of respondents and do not use the results of last year's Annual Survey.

We report a large drop of 15% from fall 1988 to fall 1989 in first-year full-time graduate students in Group I, but a large increase of 21% in Group III. For Groups I, II and III combined the numbers of full-time graduate students increased by 3% for first-year students, and 4% for all years.

Table 6: Graduate Students Percentage change, fall 1988 to fall 1989

	Groups				
	I	II	III	I+II+III	IV
	%	%	%	%	%
First year, full-time	-15	+8.4	+21	+3	-9
All years, full-time	-1	+8	+7	+4	+1

Table 7: Percentage of U.S. Citizen Women among U.S. Citizen Graduate Students, fall 1989

	Groups						
	I	II	III	I+II+III	IV	V	M
	%	%	%	%	%	%	%
First year, full-time	23	34	39	32	46	21	46
All years, full-time	22	30	36	29	46	20	45

Table 8: Citizenship of Graduate Students, fall 1989*

	Groups				
	I	II	III	IV	M
	%	%	%	%	%
First year, full-time	53	58	58	56	77
All years, full-time	50	53	59	47	74

*Percentage of U.S. citizens among graduate students whose citizenship is reported as known.

USEABLE RESPONSES

Survey	Groups I	II	III	IV	V	VI	M	B
	%	%	%	%	%	%	%	%
Departmental Profile*	92	81	80	75	23	59	54	44
Faculty Age	64	84	87	69	32	69	57	43

* There are 4 parts to the Departmental Profile form (Enrollments, Majors, Departmental Size, and Graduate Students). The number given is the percentage of returns with a useable response on the departmental size.

Acknowledgement

The Annual AMS-MAA Survey attempts to provide an accurate appraisal and analysis of various aspects of the academic mathematical scene vital to the entire mathematical community. Yearly, collegiate departments in the United States, and the doctorate-granting departments in Canada, are provided the opportunity to respond. The quantity and quality of the responses directly determine the quality of the information in these reports. Without the dedicated cooperation of the secretarial and administrative support staff in the mathematical science departments we would not be able to conduct a survey, nor be confident in our analysis of its results. We are, unfortunately, unable to thank personally all the departmental assistants for their cooperation, but it is nonetheless appreciated. However, we are able to thank the administrative support staff of the AMS, especially Marcia Almeida, Monica Foulkes, and James W. Maxwell, whose efforts are acknowledged and appreciated.

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